

CL2360USNA.ST25  
SEQUENCE LISTING

<110> E.I. duPont de Nemours and Company, Inc.  
Cheng, Qiong  
Tao, Luan

<120> GENES ENCODING CAROTENOID COMPOUNDS

<130> CL2360 US NA

<150> US 60/471,904

<151> 2003-05-20

<150> US 60/527,083

<151> 2003-12-03

<160> 20

<170> PatentIn version 3.2

<210> 1

<211> 906

<212> DNA

<213> Enterobacteriaceae strain DC260

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<212> PRT

<213> Enterobacteriaceae strain DC260

<400> 2

Met Thr Thr His Val Asp Thr Thr Ala His Gln Thr Ser Glu Leu Leu

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Gln Leu Gln Gln Ile Leu Gln Ala His Leu Glu His Leu Leu Pro Ala  
20 25 30

Gly Gln Gln Ser Asp Arg Val Arg Ala Ala Met Arg Ala Gly Thr Leu  
35 40 45

Ala Gln Gly Lys Arg Ile Arg Pro Leu Leu Leu Leu Leu Ala Ala Arg  
50 55 60

Asp Met Gly Cys Glu Leu Thr Gln Asn Gly Val Leu Asp Leu Ala Cys  
65 70 75 80

Ala Val Glu Met Val His Ala Ala Ser Leu Ile Leu Asp Asp Ile Pro  
85 90 95

Ser Met Asp Asn Ala Gln Met Arg Arg Gly Arg Pro Thr Val His Arg  
100 105 110

Glu Phe Gly Glu Asn Val Ala Ile Leu Ala Ala Ile Ala Leu Leu Ser  
115 120 125

Arg Ala Phe Glu Val Ile Ala Ile Ala Pro Gly Leu Pro Ala Ile His  
130 135 140

Lys Ser Glu Ala Ile Ala Glu Leu Ser Ala Ala Val Gly Leu Gln Gly  
145 150 155 160

Leu Val Gln Gly Gln Phe Gln Asp Leu His Asp Gly Thr Gln Ser Arg  
165 170 175

Ser Pro Glu Ala Ile Ala Met Thr Asn Glu Leu Lys Thr Ser Val Leu  
180 185 190

Phe Arg Ala Thr Leu Gln Met Ala Ala Ile Ala Ala Asp Ala Ser Pro  
195 200 205

Gln Val Arg Gln Arg Leu Ser Phe Phe Ala Gln Asp Leu Gly Gln Ala  
210 215 220

Phe Gln Leu Leu Asp Asp Leu Ala Asp Gly Cys Lys His Thr Gly Lys  
225 230 235 240

Asp Val His Gln Asp Gln Gly Lys Ser Thr Leu Val Gln Met Leu Gly  
245 250 255

Ala Asp Gly Ala Glu Arg Arg Leu Arg Asp His Leu Arg Ser Ala Asp  
260 265 270

Ala His Leu Ala Cys Ala Cys His Arg Gly Ile Ala Thr Arg Gln Tyr  
Page 2

275

280

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285

Met His Ala Leu Phe Asn Gln Gln Leu Ala Ile Phe Asn  
 290 295 300

&lt;210&gt; 3

&lt;211&gt; 1278

&lt;212&gt; DNA

&lt;213&gt; Enterobacteriaceae strain DC260

&lt;400&gt; 3

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cgcgtgatcg acgatctcgc gtcctgcacc gatatgctgt gccgcgaact gcctgcggta      300
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aaacgttttc aggccagcag cgatatctat gatcgcatca tgcgtcgtca cggcgacgtg      540
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gcggcgtggg tgacggattt cgtcgatcag cgcgcagccc tacagcacgc gcagctgttt      960
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1278

&lt;210&gt; 4

&lt;211&gt; 425

&lt;212&gt; PRT

&lt;213&gt; Enterobacteriaceae strain DC260

&lt;400&gt; 4

Met Gly His Phe Ala Val Ile Ala Pro Pro Leu Tyr Ser His Phe His  
 1 5 10 15

## CL2360USNA.ST25

Ala Leu Gln Ala Leu Ala Gln Thr Leu Leu Ala Arg Gly His Arg Ile  
 20 25 30  
 Thr Phe Ile Gln Gln Ala Asp Ala Arg Thr Leu Leu Ser Asp Glu Arg  
 35 40 45  
 Ile Asp Phe Val Ala Val Gly Gln Gln Thr His Pro Ala Gly Ser Leu  
 50 55 60  
 Ala Pro Val Leu His Arg Leu Ala Ser Pro Gly Gly Leu Ser Leu Phe  
 65 70 75 80  
 Arg Val Ile Asp Asp Leu Ala Ser Cys Thr Asp Met Leu Cys Arg Glu  
 85 90 95  
 Leu Pro Ala Val Leu Lys Ala Leu Asn Ile Asp Gly Val Ile Ala Asp  
 100 105 110  
 Glu Met Glu Ala Ala Gly Gly Leu Val Ala Glu Ala Leu His Leu Pro  
 115 120 125  
 Phe Val Ser Val Ala Cys Ala Leu Pro Val Asn Arg Glu Ala Gly Ile  
 130 135 140  
 Pro Leu Ala Val Met Pro Phe Arg Phe Ala Gln Asp Asp Lys Ala Leu  
 145 150 155 160  
 Lys Arg Phe Gln Ala Ser Ser Asp Ile Tyr Asp Arg Ile Met Arg Arg  
 165 170 175  
 His Gly Asp Val Ile Leu Lys His Ala Arg Ala Phe Asn Leu Thr Glu  
 180 185 190  
 Arg Arg Gly Leu His Gln Cys Leu Ser Pro Leu Ala Gln Ile Ser Gln  
 195 200 205  
 Met Val Pro Ala Phe Asp Phe Pro Arg Gln Gln Leu Pro Ala Cys Tyr  
 210 215 220  
 His Ala Val Gly Pro Leu Arg Ala Pro Val Ser Pro Ala Pro Leu His  
 225 230 235 240  
 Ala Pro Trp Pro Ala Leu Arg Gln Pro Val Val Tyr Ala Ser Leu Gly  
 245 250 255  
 Thr Leu Gln Gly His Arg Phe Arg Leu Phe Leu His Leu Ala Gln Ala  
 260 265 270  
 Cys Arg Gln Leu Arg Leu Ser Leu Val Ile Ala His Cys Gly Gly Leu  
 275 280 285

## CL2360USNA.ST25

Asn Ala Glu Gln Thr His Gln Leu Glu Leu Ala Gly Ala Ala Trp Val  
 290 295 300

Thr Asp Phe Val Asp Gln Arg Ala Ala Leu Gln His Ala Gln Leu Phe  
 305 310 315 320

Ile Thr His Ala Gly Leu Asn Ser Ala Leu Glu Ala Leu Glu Cys Gly  
 325 330 335

Thr Pro Met Leu Ala Leu Pro Ile Ala Phe Asp Gln Pro Gly Val Ala  
 340 345 350

Ala Arg Ile Glu Trp His Asp Val Gly Arg Arg Ala Ser Arg Phe Ser  
 355 360 365

Arg Val His Gln Leu Glu Gln His Leu Gln Gln Leu Leu Thr Asp Asp  
 370 375 380

Arg Tyr Ala Leu Arg Met Ser Ala Ile Gln Ala Gln Leu Gln Arg Ala  
 385 390 395 400

Gly Gly Cys Gln Arg Ala Ala Asp Ile Val Glu Gln Ala Leu Cys Gln  
 405 410 415

Gln Gln Val Val Leu Ala Glu Ala Thr  
 420 425

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 ccggcaggca atcatacctg gtcgtttcat cacagcgatc tcagcgccga acaacttcgc 180  
 tggctgcaac cgctgattac cgtgcgttgg tcaggttatc aggtgcgttt tcctgcgctg 240  
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 tacgcggcga tgggtgacga tctgtggaca aacacagccg tacaacaggt aaaaccacg 360  
 caggtgacgc tggcggatgg ccgtgaactt gctgcgcaag tgggtgattga tggtcgcggc 420  
 ctgcagccga cgccacatct gcagctgggt tatcaggtgt ttcttggaaca agagtggcag 480  
 ctggcgcagc cgcacggcct gcagcagccg atcctgatgg atgccaccgt cgatcagcaa 540  
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 acccattacg ttaaccagcc cgcgctggcg gagaacaccg ctcgtcagca catcgccgac 660  
 tatgccaatc agcaaggctg gacgctgagt acgctgctgc gtgaagagca cggcatatta 720  
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## CL2360USNA.ST25

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ctcgatgccg ggtaattag ccgcttttac gccgggcaac tgcgcctgcg cgataaaacg    1080
cggattctgt gcggcaagcc gccggtgccc atcggtgaa cgctgcgcgc gctgttgaat    1140
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<210> 6
<211> 388
<212> PRT
<213> Enterobacteriaceae strain DC260

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<400> 6
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1           5           10           15

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```

Gly Leu Ile Ala Leu Arg Leu Arg Gln Leu Gln Pro Gln Leu Lys Cys
          20           25           30

```

```

Leu Leu Leu Glu Ser Asp Ala His Pro Ala Gly Asn His Thr Trp Ser
          35           40           45

```

```

Phe His His Ser Asp Leu Ser Ala Glu Gln Leu Arg Trp Leu Gln Pro
          50           55           60

```

```

Leu Ile Thr Val Arg Trp Ser Gly Tyr Gln Val Arg Phe Pro Ala Leu
65           70           75           80

```

```

Arg Arg Asn Leu Asp Gly Asp Tyr Cys Ser Ile Ala Ser Gly Asp Phe
          85           90           95

```

```

Ala Arg His Leu Tyr Ala Ala Met Gly Asp Asp Leu Trp Thr Asn Thr
          100          105          110

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```

Ala Val Gln Gln Val Lys Pro Thr Gln Val Thr Leu Ala Asp Gly Arg
          115          120          125

```

```

Glu Leu Ala Ala Gln Val Val Ile Asp Gly Arg Gly Leu Gln Pro Thr
          130          135          140

```

```

Pro His Leu Gln Leu Gly Tyr Gln Val Phe Leu Gly Gln Glu Trp Gln
          145          150          155          160

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```

Leu Ala Gln Pro His Gly Leu Gln Gln Pro Ile Leu Met Asp Ala Thr
          165          170          175

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```

Val Asp Gln Gln Ala Gly Tyr Arg Phe Val Tyr Thr Leu Pro Leu Ser

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180

185

190

Ala Asp Arg Leu Leu Ile Glu Asp Thr His Tyr Val Asn Gln Pro Ala  
 195 200 205

Leu Ala Glu Asn Thr Ala Arg Gln His Ile Ala Asp Tyr Ala Asn Gln  
 210 215 220

Gln Gly Trp Thr Leu Ser Thr Leu Leu Arg Glu Glu His Gly Ile Leu  
 225 230 235 240

Pro Ile Thr Leu Ser Gly Asn Ile Asp Arg Phe Trp Gln Gln Gln Arg  
 245 250 255

Gly Gln Ala Cys Ser Gly Leu Arg Ala Gly Leu Phe His Ala Thr Thr  
 260 265 270

Gly Tyr Ser Leu Pro Ser Ala Val Ala Leu Ala Glu Leu Val Ala Ala  
 275 280 285

Leu Leu Pro Thr Asp Ala Leu Thr Leu Ser Gln His Ile Glu Arg Phe  
 290 295 300

Ala Arg Gln Gln Trp Arg Glu Gln Arg Phe Phe Arg Leu Leu Asn Arg  
 305 310 315 320

Met Leu Phe Leu Ala Gly Lys Pro Gln Gln Arg Trp Arg Val Met Gln  
 325 330 335

Arg Phe Tyr Arg Leu Asp Ala Gly Leu Ile Ser Arg Phe Tyr Ala Gly  
 340 345 350

Gln Leu Arg Leu Arg Asp Lys Thr Arg Ile Leu Cys Gly Lys Pro Pro  
 355 360 365

Val Pro Ile Gly Glu Ala Leu Arg Ala Leu Leu Asn Ser Val Glu Pro  
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Gly Lys Lys Lys  
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<210> 7

<211> 1482

<212> DNA

<213> Enterobacteriaceae strain DC260

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tatgtgtttg aggacagtgg ctttaccttc gatgccggac ccacggtgat caccgatccc 180

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## CL2360USNA.ST25

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tatctggtgg gtgccggtac gcatccaggc gcgggcgtgc ccggcgtgat cggttcggcc 1440
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&lt;210&gt; 8

&lt;211&gt; 493

&lt;212&gt; PRT

&lt;213&gt; Enterobacteriaceae strain DC260

&lt;400&gt; 8

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Met Lys Arg Thr Tyr Val Ile Gly Ala Gly Phe Gly Gly Leu Ala Leu
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```

```

Ala Ile Arg Leu Gln Ala Ala Gly Ile Pro Thr Thr Leu Leu Glu Gln
20           25           30

```

```

Arg Asp Lys Pro Gly Gly Arg Ala Tyr Val Phe Glu Asp Ser Gly Phe
35           40           45

```

```

Thr Phe Asp Ala Gly Pro Thr Val Ile Thr Asp Pro Ser Ala Ile Glu
50           55           60

```

```

Glu Leu Phe Thr Leu Ala Gly Lys Ser Leu Ser Asp Tyr Val Glu Leu

```



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65

70

75

80

Met Pro Val Thr Pro Phe Tyr Arg Leu Cys Trp Glu Asp Gly Lys Gln  
85 90 95

Leu Asp Tyr Asp Asn Asn Gln Pro Leu Leu Glu Gln Gln Ile Ala Thr  
100 105 110

Phe Asn Pro Gln Asp Val Glu Gly Tyr Arg Gln Phe Leu Ala Tyr Ser  
115 120 125

Arg Glu Val Phe Arg Glu Gly Tyr Leu Lys Leu Gly Thr Val Pro Phe  
130 135 140

Leu Gln Val Arg Asp Met Leu Arg Val Ala Pro Gln Leu Gly Arg Leu  
145 150 155 160

Gln Ala Trp Arg Ser Val Tyr Ser Met Val Ala Lys Phe Ile Gln Asp  
165 170 175

Asp His Leu Arg Gln Ala Phe Ser Phe His Ser Leu Leu Val Gly Gly  
180 185 190

Asn Pro Phe Ala Thr Ser Ser Ile Tyr Thr Leu Ile His Ala Leu Glu  
195 200 205

Arg Glu Trp Gly Val Trp Phe Pro Arg Gly Gly Thr Gly Ala Leu Val  
210 215 220

Gln Gly Met Ala Arg Leu Phe Glu Asp Leu Gly Gly Glu Leu Leu Leu  
225 230 235 240

Asn Ala Glu Val Ser Gln Leu Glu Thr Ser Gly Asn Arg Ile Ser Gly  
245 250 255

Val Gln Leu Glu Gly Gly Arg Arg Phe Asp Ala Ala Ala Val Ala Ser  
260 265 270

Asn Ala Asp Val Val His Thr Tyr Asp Lys Leu Leu Arg His His Pro  
275 280 285

Leu Ala Met Lys Arg Ala Thr Ser Leu Lys Arg Lys Arg Met Ser Asn  
290 295 300

Ser Leu Phe Val Leu Tyr Phe Gly Leu Asn Gln Pro His Glu Gln Leu  
305 310 315 320

Ala His His Thr Val Cys Phe Gly Pro Arg Tyr Arg Glu Leu Ile Asp  
325 330 335

Glu Ile Phe Asn Ser Ser Gln Leu Ala Asp Asp Phe Ser Leu Tyr Leu

340

345

350

His Ala Pro Cys Ser Ser Asp Pro Ser Leu Ala Pro Pro Gly Cys Gly  
 355 360 365

Ser Phe Tyr Val Leu Ala Pro Val Pro His Leu Gly Thr Ala Asp Ile  
 370 375 380

Asp Trp Gln Gln Glu Gly Pro Arg Leu Arg Asp Arg Ile Phe Ala Tyr  
 385 390 395 400

Leu Glu Gln His Tyr Met Pro Gly Leu Arg Gln Gln Leu Val Thr His  
 405 410 415

Arg Met Phe Thr Pro Phe Asp Phe Arg Asp Thr Leu His Ala His His  
 420 425 430

Gly Ser Ala Phe Ser Leu Glu Pro Ile Leu Thr Gln Ser Ala Trp Phe  
 435 440 445

Arg Pro His Asn Arg Asp Ala Asp Ile Ser Asn Leu Tyr Leu Val Gly  
 450 455 460

Ala Gly Thr His Pro Gly Ala Gly Val Pro Gly Val Ile Gly Ser Ala  
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Lys Ala Thr Ala Arg Leu Met Leu Glu Asp Arg Ala Glu  
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 <213> Enterobacteriaceae strain DC260

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 gcctacagcg gcgcgcacat ggatgaaccg gcgtttaggg cgtttcagga agtggcgatc 300  
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 cgcaacgaac attacgcgag cttcgatgac acgctgcgtt actgctatca cgtcgcgggc 420  
 gtggtcggtt tgatgatggc gcgcgtaatg ggcgtgcgcg acgaagcggg gctcgatcac 480  
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 gccgaaaatg gtcgctgcta tctgccgcaa tcctggctcg atcaggcggg attacgcgcc 600  
 gatacgctga ctgcaccgca acatcgtgca gcgctcgcc cactggcagc gcgttttagtg 660  
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## CL2360USNA.ST25

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<210> 10
<211> 309
<212> PRT
<213> Enterobacteriaceae strain DC260

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<400> 10

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1          5          10          15

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```

Gly Ser Lys Ser Phe Ala Thr Ala Ala Lys Leu Phe Asp Ala Pro Thr
20          25          30

```

```

Arg Arg Ser Thr Leu Met Leu Tyr Ala Trp Cys Arg His Cys Asp Asp
35          40          45

```

```

Val Ile Asp Gly Gln Thr Leu Gly Glu Gly Gly Thr Gln His Ala Val
50          55          60

```

```

Glu Asp Ala Gln Ala Arg Met Gln His Leu Gln Ile Glu Thr Arg Arg
65          70          75          80

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Ala Tyr Ser Gly Ala His Met Asp Glu Pro Ala Phe Arg Ala Phe Gln
85          90          95

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Glu Val Ala Ile Ile His Gln Leu Pro Gln Gln Leu Ala Phe Asp His
100          105          110

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```

Leu Glu Gly Phe Ala Met Asp Ala Arg Asn Glu His Tyr Ala Ser Phe
115          120          125

```

```

Asp Asp Thr Leu Arg Tyr Cys Tyr His Val Ala Gly Val Val Gly Leu
130          135          140

```

```

Met Met Ala Arg Val Met Gly Val Arg Asp Glu Ala Val Leu Asp His
145          150          155          160

```

```

Ala Cys Asp Leu Gly Leu Ala Phe Gln Leu Thr Asn Ile Ala Arg Asp
165          170          175

```

```

Ile Val Glu Asp Ala Glu Asn Gly Arg Cys Tyr Leu Pro Gln Ser Trp
180          185          190

```

```

Leu Asp Gln Ala Gly Leu Arg Ala Asp Thr Leu Thr Ala Pro Gln His
195          200          205

```

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Arg Ala Ala Leu Ala Ser Leu Ala Ala Arg Leu Val Ala Glu Ala Glu  
210 215 220

Pro Tyr Tyr His Ser Ala Arg Ser Gly Leu Pro Gly Leu Pro Leu Arg  
225 230 235 240

Ser Ala Trp Ala Ile Ala Thr Ala Arg Gly Val Tyr Arg Glu Ile Gly  
245 250 255

Val Lys Val Gln His Ala Gly Val His Ala Trp Asp Ser Arg Gln Arg  
260 265 270

Thr Ser Lys Gly Glu Lys Leu Ala Leu Leu Val Lys Gly Ala Gly Leu  
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Trp Gln Arg Pro Arg  
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<212> DNA  
<213> Enterobacteriaceae strain DC260

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